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Edible lactarius mushrooms poisoning: An emergency department experience

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Abstract
Aim: We aimed to examine the reasons for applying to the emergency department after eating Lactarius species mushrooms, which are consumed quite frequently in our region, and the relationship between the clinical outcomes of the patients and their laboratory values.
Material and Methods: This was a cross-sectional study. Patients older than 18 years of age who presented to the emergency department with various signs and symptoms after eating mushrooms were included in the study. The patient's age, gender, comorbidities, and laboratory data were recorded from the hospital information system. Complaints of the patients at the time of admission, the treatment, which was given in the emergency department, the presence and duration of hospitalization were recorded.
Results: The number of patients included in the study was 34, 19 (55.9%) of whom were women and 17 (50%) of the patients were hospitalized. The most common comorbidity was diabetes (38.2%), and the most common symptom was nausea (61.8%). The CRP value of the inpatients was 7.60 [4.30-14.80], the potassium value was 4.57 (±0.43), and the aPTT value was 29.30 [27.10-33.70], which was statistically higher than in the patients who were not hospitalized (p-values were 0.022, 0.042, and 0.030 respectively).
Discussion: Lactarius mushrooms are edible mushroom species that are benign but can cause gastrointestinal symptoms. CRP can be a useful laboratory value to predict gastrointestinal symptoms and to determine the decision to hospitalization.

Keywords
Mushroom, Poisoning, Nausea, Emergency, Hospitalization

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Introduction

Although there are approximately 5000 known mushroom species, only around 100 have been reported to be poisonous and their toxicity has been recorded [1]. Morbidity and mortality due to toxic mushroom consumption continue to be a health issue in numerous countries. The annual mortality is still unknown [2]. Although it varies depending on the species, toxicity due to mushroom consumption can range from mild gastrointestinal manifestations to several organs' failure, and death [3]. In the diagnosis, identification of the mushroom, symptoms, and laboratory parameters are used. Previous studies have demonstrated the incidence of poisoning or mild symptoms arising from the consumption of edible mushroom species [4].

Lactarius mushrooms (Lactarius deliciosus, L. deterrimus, L. volumes, and L. salmonicolor) are edible mushroom species that grow in woodlands and are consumed due to their unique taste [5]. These mushroom species are also grown in the pine and oak forests in Turkey and are consumed and sold in the open markets [6]. This type of mushroom is also common in our region [7]. Although there are several studies on toxic mushroom poisoning in the literature, there have only been a few studies conducted on the toxicity resulting from edible mushroom species, especially Lactarius species. To the best of our knowledge, this study is one of the few reports on the Lactarius species, which has the highest number of poisoning cases.

In the present study, we aimed to examine the reasons for the admission of patients to the emergency department after consuming Lactarius mushrooms, which are consumed frequently in our region, and the relationship between the clinical outcomes of the patients and their laboratory findings.

Material and Methods

Study Design:

This cross-sectional study included patients who were admitted to a tertiary emergency department following complaints after consuming mushrooms. Hospitalization of the patients depended on the timeframe within which the clinical symptoms emerged after the consumption of the mushrooms; those who developed clinical symptoms after ≥6 hours were hospitalized. The study was conducted in accordance with the Declaration of Helsinki and was initiated after approval of the Local Ethics Committee (approval no:2021/781).

Patient Selection:

This study included patients over the age of 18 who presented to the emergency department with various clinical symptoms after consuming mushrooms. In the clinic, the patients were shown photos of various mushroom species to determine the mushroom (Figure 1).

In this way, the mushroom species were identified, and the information was recorded in the hospital information system. Patients who had consumed Lactarius mushrooms were also determined in this manner. The exclusion criteria included patients who were under the age of 18, whose laboratory parameters or demographic data could not be accessed, and those for whom the information system did not list the mushroom species consumed or showed that the consumed mushroom species were not Lactarius.

Data Collection:

Data on the age, gender, and comorbidities of the patients, as well as their urea, creatinine, AST, ALT, C-reactive protein (CRP), white blood cell (WBC), sodium, potassium, INR, and aPTT levels were obtained from the hospital information system. The symptoms of the patients at the time of admission (nausea, vomiting, stomachache), information on the treatment provided in the emergency department (intravenous fluids, anti-emetic, anti-spasmolytic, antacid), and duration of hospitalization were also recorded.

Outcome:

The determination of the relationship between the clinical outcomes and the laboratory findings of the patients admitted to the emergency department due to Lactarius mushroom poisoning.

Statistical Analysis:

The IBM SPSS Statistics 22 (IBM SPSS, Turkey) software was used for the statistical analysis of the data. The Shapiro–Wilk test was employed to check the normal distribution of the parameters. The data were presented using descriptive statistical methods (mean, standard deviation, median, interquartile range, and frequency). Quantitative parameters between the groups were compared using the Mann–Whitney U test. The Chi-square test was used to compare qualitative data, and the level of significance was taken as $p < 0.05$.

Results

A total of 59 patients were included in the study. Of these, 14 were excluded due to the consumption of cultivated mushrooms, six of the patients could not identify the type of mushroom consumed, and four patients lacked the required data. The final number of patients included in the study was 34, 19 (55.9%) of whom were women and 17 (50%) of the patients were hospitalized.

In the entire patient group, the most common comorbidity was diabetes (13 [38.2%] patients). The most common symptom was nausea (61.8%). The most administered treatment was intravenous fluid therapy (32 [94.1%] patients). Data on patient demography, comorbidities, and treatments are summarized in

Figure 1. Lactarius Mushroom Pictures

Table 1.

The WBC levels of the patients were 11963 (±3122), while the CRP levels were 7.10 (2.40–10.30). The levels of the other parameters were determined to be within the normal range in the entire patient group, which is summarized in Table 2.

On comparing laboratory findings of inpatients and outpatients, the CRP levels of the inpatients were 7.60 (4.30–14.80), potassium levels were 4.57 (±0.43), and the aPTT levels were 29.30 (27.10–33.70), which was significantly higher than in outpatients (p values were 0.022, 0.042, and 0.030, respectively). No significant difference was found between other laboratory parameters (Table 3).

Table 1. Demographic data, additional diseases, and treatments of patients

Variable	Value
Age (mean [IQR])	47 [34-62]
Gender (male) n (%)	15 (44.1%)
DM n (%)	11 (32.4%)
HT n (%)	13 (38.2%)
Ischemic Heart Disease n (%)	6 (17.6%)
Cerebrovascular Event n (%)	2 (5.9%)
Diarrhea n (%)	5 (14.7%)
Nausea n (%)	21 (61.8%)
Vomiting n (%)	24 (70.6%)
Stomachache n (%)	5 (14.7%)
Intravenous Fluids n (%)	32 (94.1%)
Anti-emetic n (%)	23 (67.6%)
Anti-spasmolytic n (%)	12 (35.3%)
Antacid n (%)	19 (55.9%)
Hospitalization n (%)	17 (50.0%)
Duration of Hospitalization/day (mean [IQR])	3 [2-4]

Table 2. Laboratory values of patients

Variable	Value
WBC (Normal range [4000-10000] 106/L)	11963 (±3122) [Δ]
CRP (Normal range [0-7] mg/dl)	7.10 [2.40-10.30] [¥]
Urea (Normal range [10-49] mg/dl)	37.24 (±11.35)
Creatinine (Normal range [0.5-1.3] mg/dl)	0.87 (±0.20)
AST (Normal range [5-34] U/L)	24.00 [20.00-34.00]
ALT (Normal range [10-49] U/L)	22.00 [15.00-29.00]
Sodium (Normal range [132-146] mEq/L)	139.88 (±2.49)
Potassium (Normal range [3.5-5.5] mEq/L)	4.40 (±0.47)
aPTT (Normal range [22.8-31] m)	27.90 [21.20-32.10]
INR (Normal range [0.8-1.2] mg/dl)	1.02 [0.97-1.09]

[Δ] Mean ± standard deviation, [¥] Median [Interquartile range 25-75]

Table 3. Comparison of age and laboratory values of inpatients and outpatients

Variable	Inpatient	Outpatient	p
Age	47 [32-62]	48 [37-63]	0.863 [T-]
WBC	11613 (±3196)	11419 (±3419)	0.865*
CRP	7.60 [4.30-14.80]	3.49 [2.07-8.45]	0.022
Urea	35.21 (±12.93)	36.41 (±9.83)	0.764
Creatinine	0.87 (±0.25)	0.80 (±0.13)	0.307
AST	27.00 [21.50-36.00]	23.00 [19.25-31.25]	0.653
ALT	23.00 [15.00-29.00]	20.00 [15.50-26.75]	0.796
Sodium	139.87 (±2.66)	140.35 (±2.20)	0.569
Potassium	4.57 (±0.43)	4.27 (±0.40)	0.042
aPTT	29.30 [27.10-33.70]	22.70 [20.35-28.80]	0.030
INR	1.02 [1.01-1.08]	1.01 [0.95-1.09]	0.288

*Student's t-test , [T-] Mann-Whitney U test

Discussion

Locals who live in the regions where edible Lactarius mushrooms grow have been consuming them for several years [7]. Although edible mushrooms are frequently consumed, they are known to produce toxic effects. These mushrooms do not contain specific toxins; however, problems during their collection, transportation, and storage and a decrease in the trehalase activity in those who consume it can cause nausea, vomiting, increased gastrointestinal gas, abdominal bloating, and diarrhea [4,8]. In our study, vomiting, nausea, diarrhea, and abdominal pain in patients were observed.

Symptoms that develop due to edible mushroom poisoning are usually benign and the treatment is symptomatic and supportive [9]. In addition, antiemetics can be administered, especially in patients with early-onset gastrointestinal symptoms who are admitted to the hospital with nausea or vomiting [10]. In the present study, 94.1% of the patients were administered intravenous fluids, and 67.6% were given antiemetics.

Previous literature has reported on allergic reactions caused by mushrooms. Even nontoxic edible mushrooms, which are thought to be safe to consume, can cause abdominal discomfort [11]. Trehalose, also known as mushroom sugar, is a disaccharide that is broken down in the small intestine by the enzyme trehalase [12]. Trehalose cannot be broken down at low levels of this enzyme, which causes a kind of intolerance. Developing this intolerance generates a slight inflammation of the intestines. CRP is an acute inflammatory protein that rapidly increases during inflammation or infection [13]. In our study, significant differences were found in the CRP levels between the hospitalized and discharged patients. This can be associated with the severity of intolerance generated in the patients.

For the evaluation of the symptoms that developed due to mushroom consumption, it is imperative to first identify the species of mushrooms consumed by the patients admitted to the hospital and rule out the possibility of consuming any poisonous mushrooms [4]. However, a few studies in the literature show that edible mushroom species are the most common cause of mushroom poisoning [14]. Although the mortality rate is low in non-amatoxin mushroom poisoning, mortality from edible mushrooms is extremely rare. In the present study, 50% of the patients were hospitalized for follow-ups due to late-onset (≥6 hours) symptoms, but no mortality was observed in any of the patients.

Conclusion

Lactarius mushrooms are edible mushroom species that are benign but can cause gastrointestinal symptoms. CRP can be a useful laboratory value to predict gastrointestinal symptoms and to determine the decision to hospitalization.

Scientific Responsibility Statement
The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement
All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest
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